Application of Modeling and Simulations in the Operational Testing of Fire Support Command and Control Systems

Mr Don Krejcarec
USAOTC Fire Support
Test Directorate

Quality Control for the US Army

AGENDA

Role of Simulation-Stimulation in Operational Testing (OT)

Fire Support Automated Test System (FSATS)

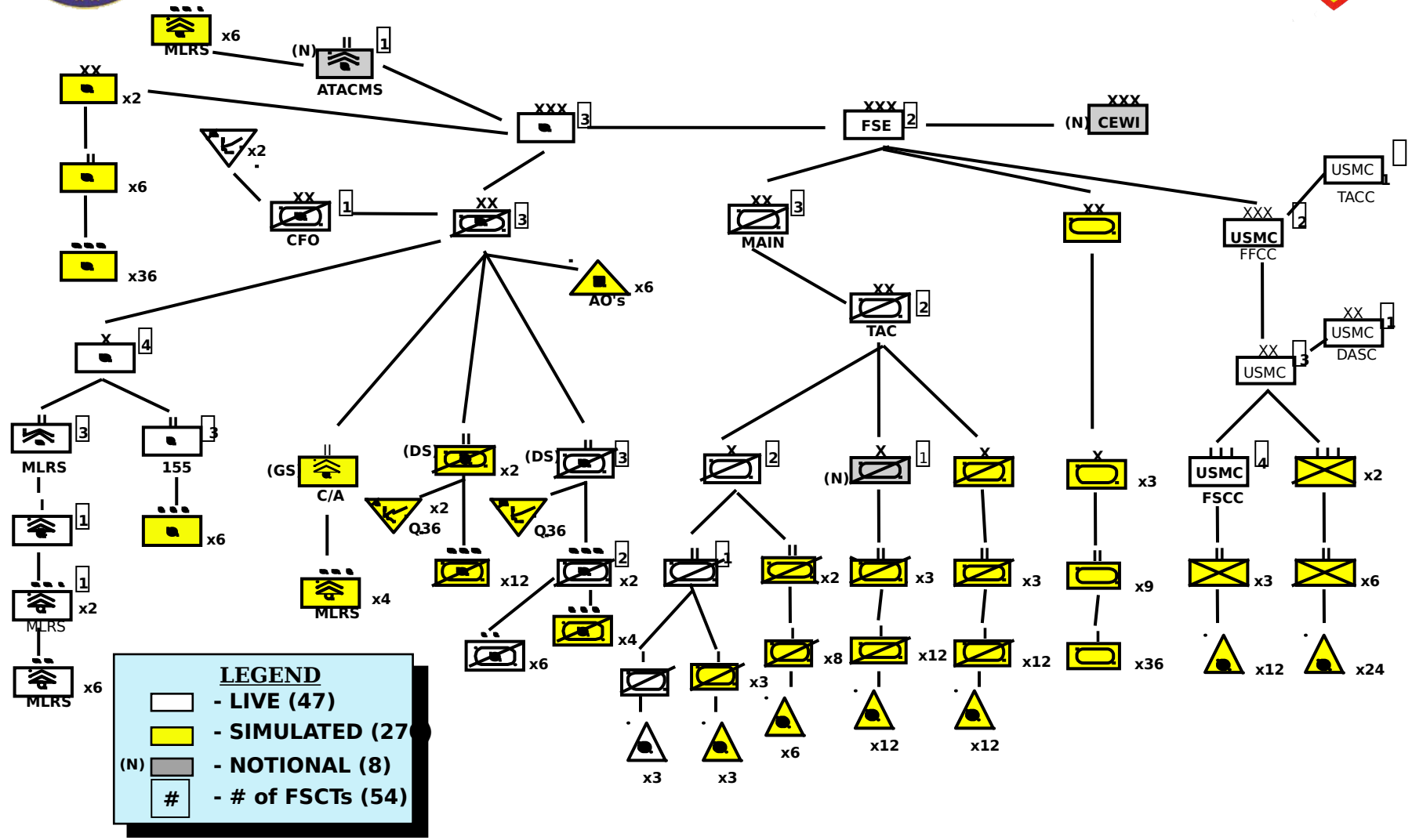
Extensible C4I Instrumentation Suite -Fire Support Application (ExCIS - FSA)

Summary

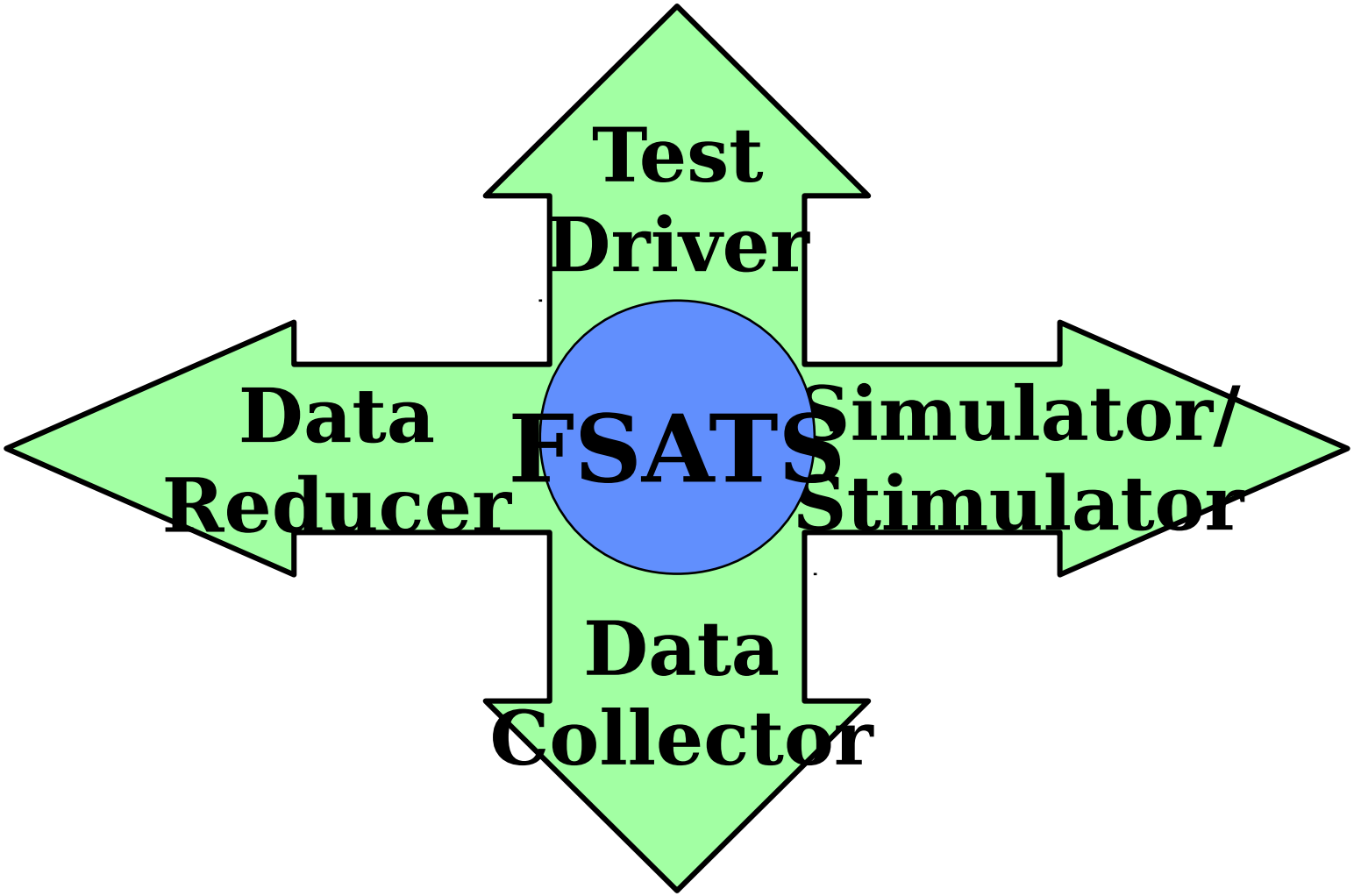
TEST REQUIREMENTS

- **AFATDS IOTE and LUTs.**
  - **Focus on corps level functionality**
  - **Requires 325+ nodes to properly evaluate corps-level fire support functions, which included:**
    - **III Armored Corps Artillery (Corps Arty and FSE)**
    - **FA Brigade TOC (2 MLRS Bns/batterys w/ 12 M-270 launchers and 2 cannon Bns/batterys w/ 12 Paladin howitzers)**
    - **1st Cavalry Division Artillery (DIVARTY, Div (TAC)/Bde/Bn FSEs, FA Cannon Bn/Battery CPs, and MLRS Bn/battery CPs)**
    - **1st Marine Expeditionary Force (MEF) (MEF Forward FFCC, Regiment and Bn FSCCs, FA Bn/battery CPs, TACC, and DASC)**
  - **Constrained resources (personnel and resources)**

AFATDS OT LAYDOWN

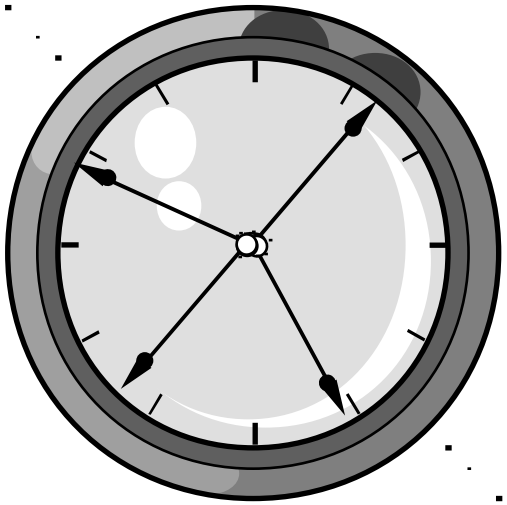


WHAT IS FSATS?



TEST DRIVER

- **Clock-driven scenario driver (Time-Ordered Events List)**



0906: Call For Fire, Tgt 1

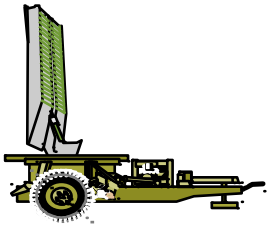
0925: Conduct Unit Move

0936: Update Location

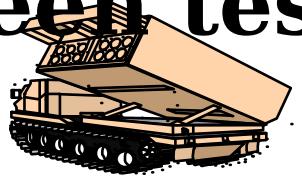
0949: Call For Fire, Tgt 2

SIMULATOR / STIMULATOR

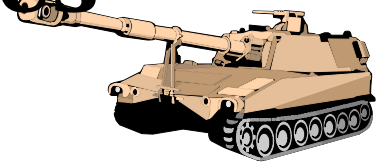
- **Simulate player nodes**
- **Stimulate data/message inputs**
- **Stimulate interaction between test nodes**



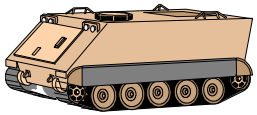
Q-36/Q-37 Radars



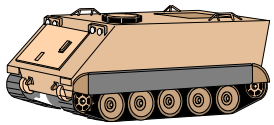
MLRS Btry/Bn CPs



M109 FA Plts



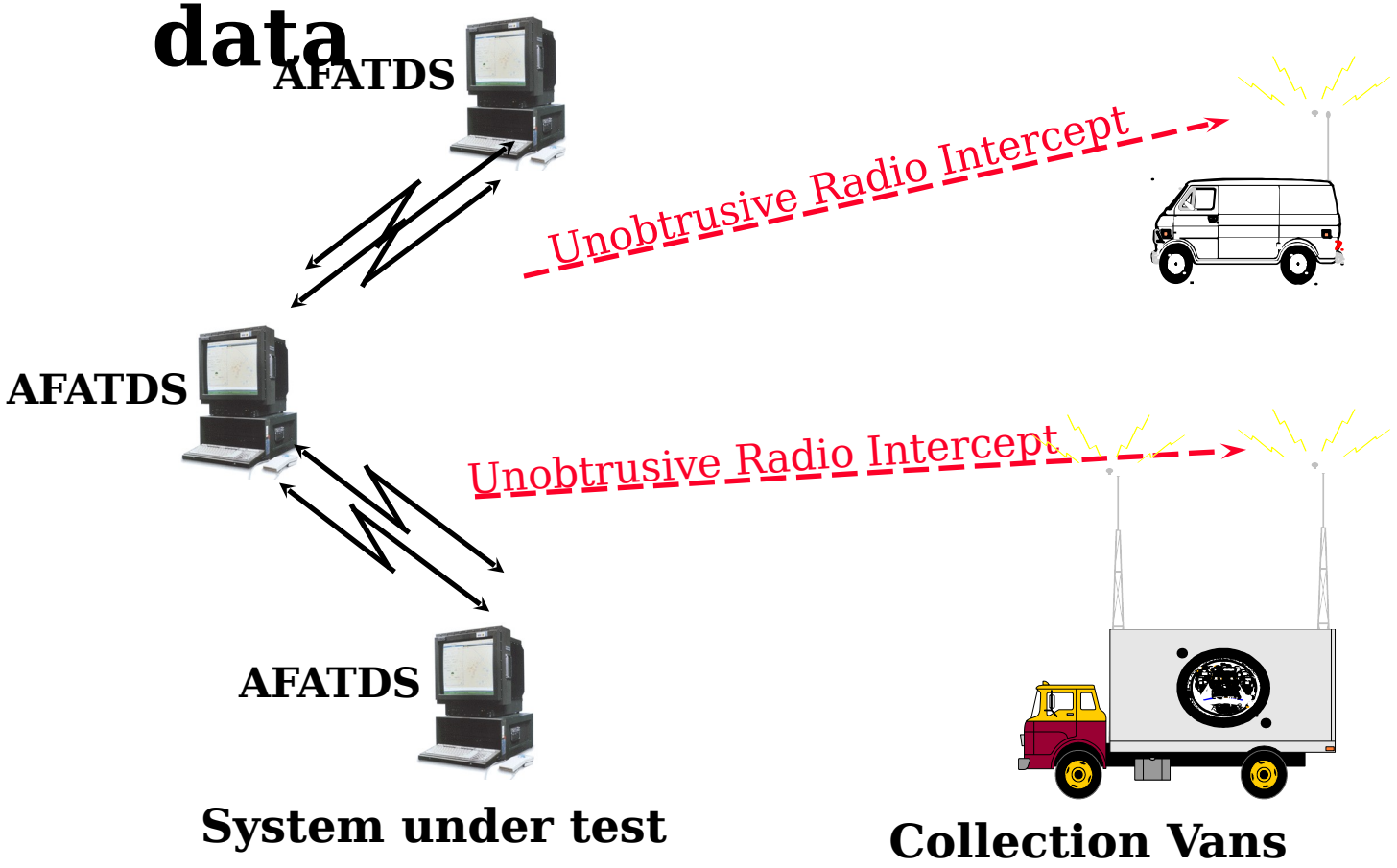
Bn/Bde/Div FSEs



Bn/Bde/Div FA CPs

DATA COLLECTOR

- **Monitor and record all data**



DATA REDUCER

- Produce message audit trail
- Summarize message traffic
- Resolve duplicate collection
- Create tables, summaries, frequencies, and reports

SIM-STIM VALUE ADDED

Materiel Developer

- Unable to field AFATDS to entire corps just for operational testing
- Needs early identification and resolution of software problems

Combat Developer

- Needs capability to assess doctrinal issues and concerns

Evaluator

- Requires operational realism
- Needs corps-level operational intensity

Developer's Needs and Requirements

Operational Realism

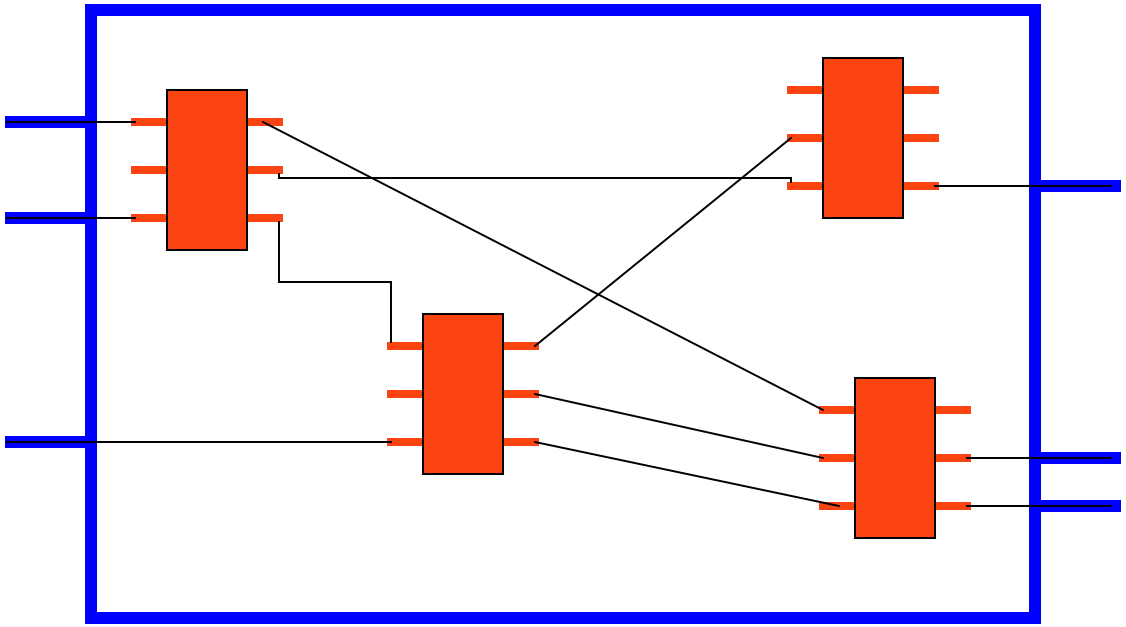
FSATS is the "bridge" between developer's needs and operational realism, providing "hard data" at reduced cost

SIM/STIM VALUE ADDED AFATDS OT (A '95, A'97, A'98 & A'99)

Requirements	w/o FSATS	w/ FSATS	Savings
Total Costs	$ 9.8 M	$ 2.5 M	$ 7.3 M

FSATS Technology

- Follows age-old software library paradigm
  - Modules have interfaces
  - System built by wiring (coding) existing modules together



Problems

- **Difficult to Automate ⇒ TAKES TIME**
- **Difficult to Change ⇒ EXPENSIVE**
- **Expert Intensive ⇒ EXPENSIVE**

ExCIS-FSA Approach

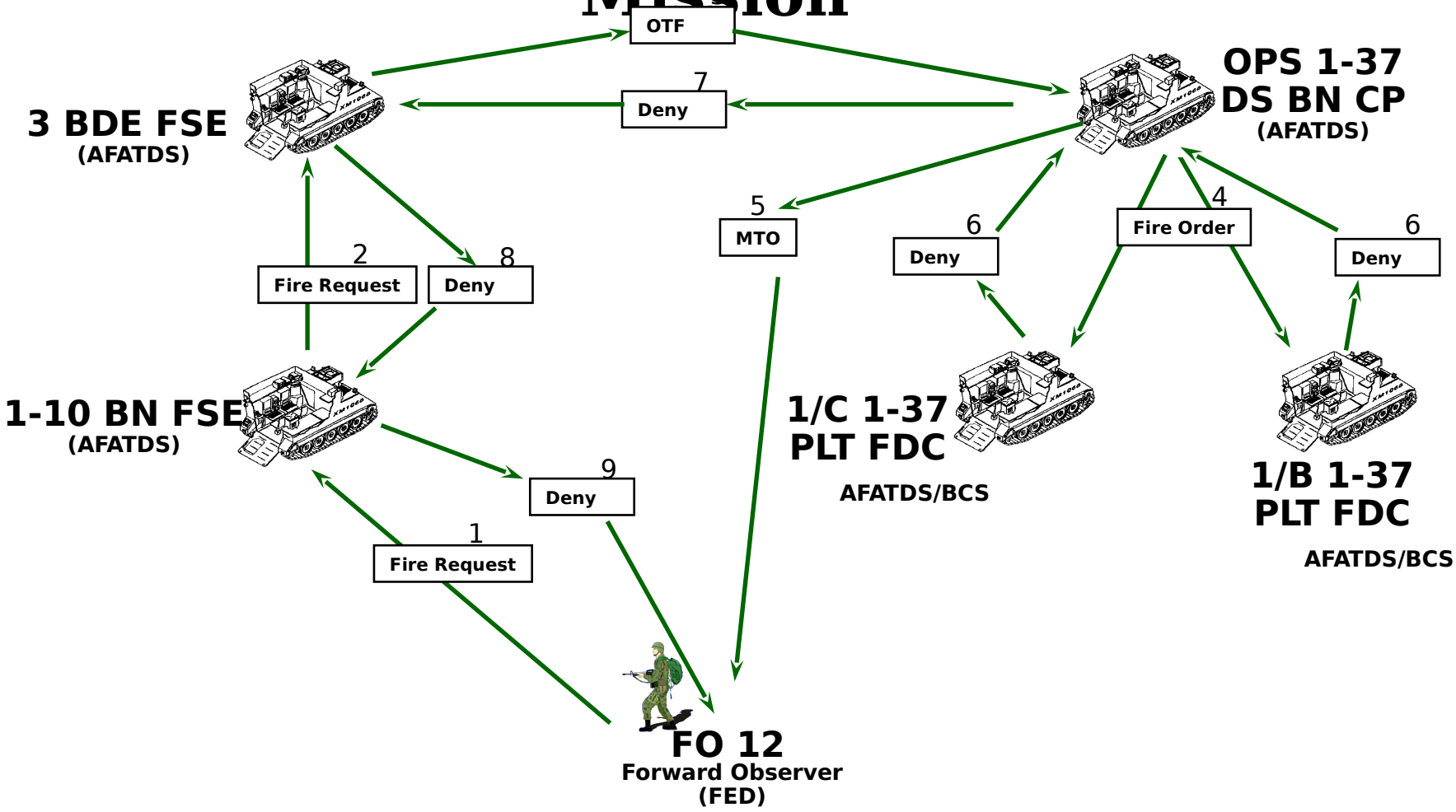
- Integration of 3 technologies:
  - Domain-Specific Languages (DSLs)
  - Feature-Oriented Programming (FOP)
  - Visual Programming (VP)

GOAL

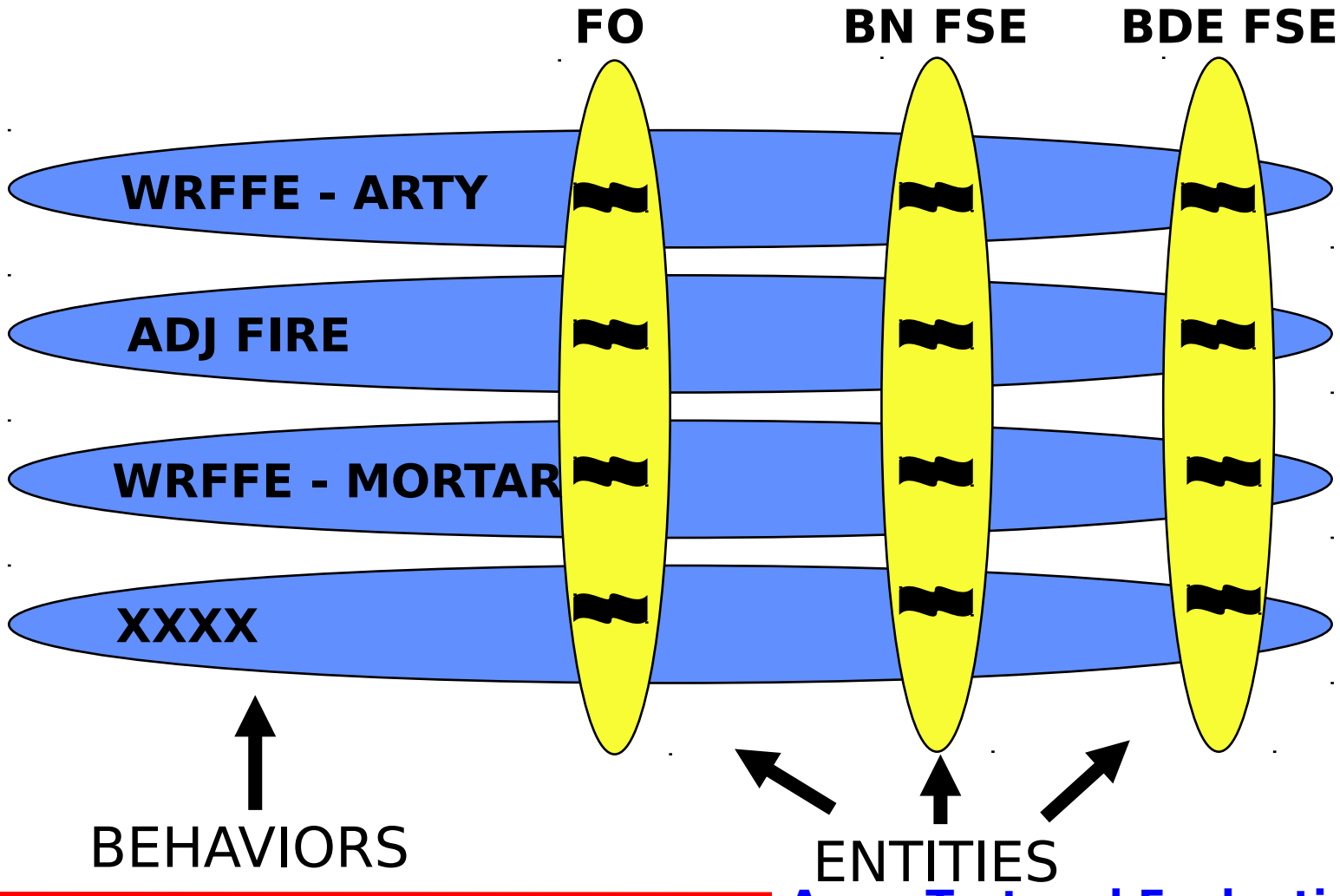
- Capture and represent simulation behavior in a form
  that the domain expert can understand and manipulate.

- Allows the expert to create new simulation behavior
  and modify existing simulation behavior

Domain Experts Notation- Observed Cannon Mass Fire Mission

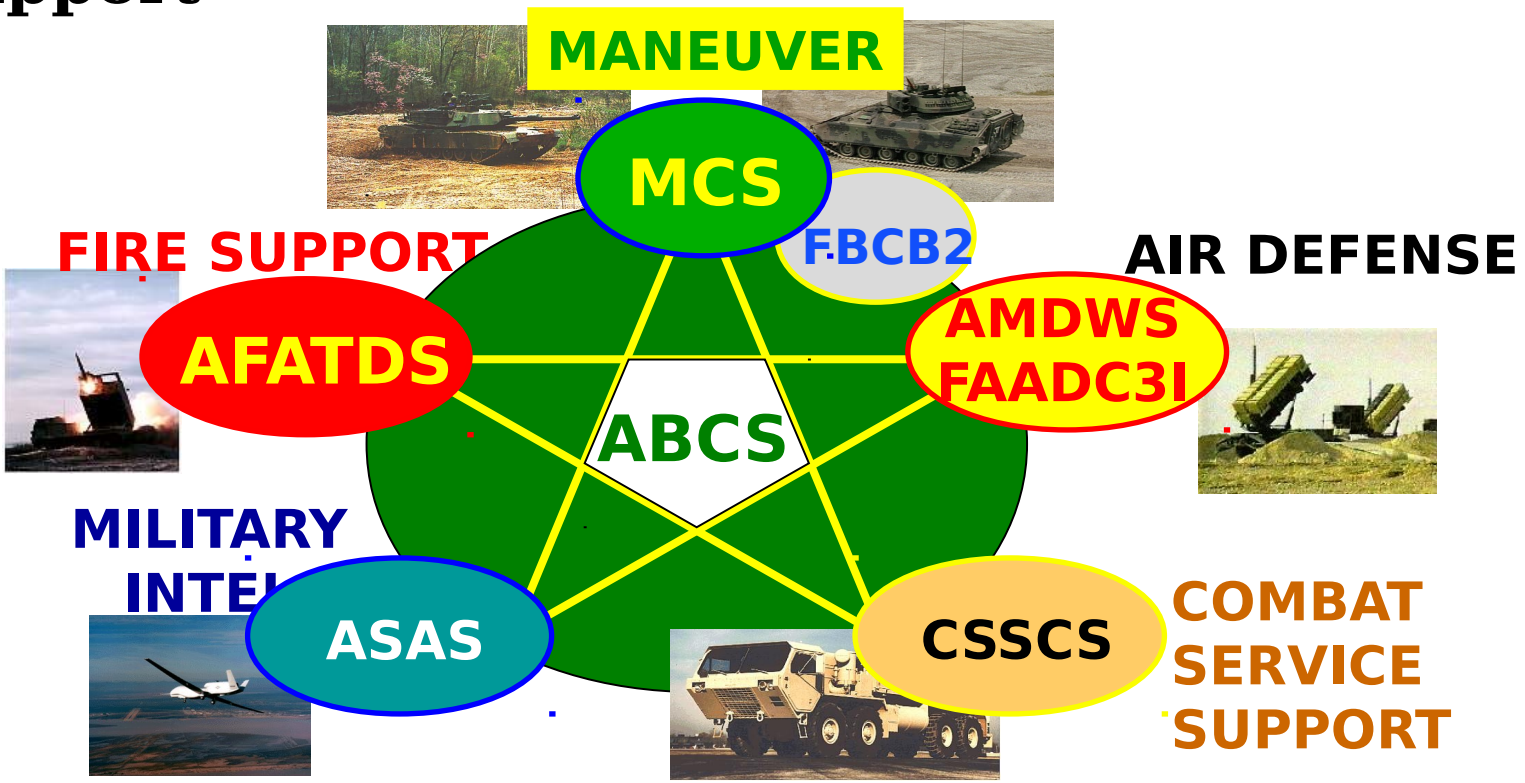


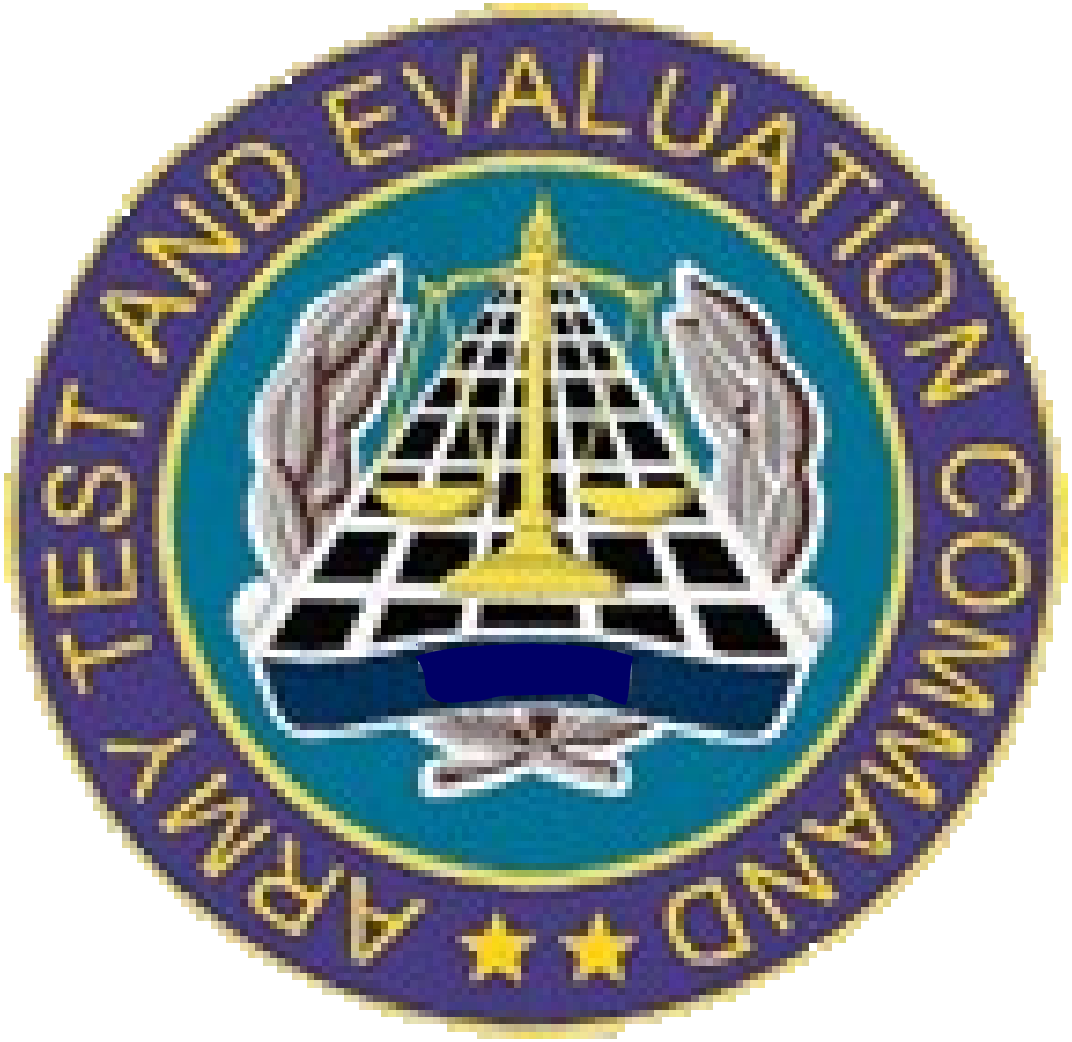
ExCIS FSA Focus



Extensibility

ExCIS has general purpose extensible software technology that can apply to domains other than fire support




ARMY TEST AND EVALUATION COMMAND